

Rock Chips

Spring 2008

The Digital Atlas of Alberta Geology — A New AGS Initiative

The Mapping Section of the Alberta Geological Survey (AGS), part of the Energy Resources Conservation Board (ERCB), has initiated work on a digital atlas of Alberta geology. Products from the first version are slated to be available via the internet in 2012. Unlike its predecessor (the 1994 Atlas of the Western Canada Sedimentary Basin), which was in a paper format, the new atlas will be updated online as new information is incorporated.

Near-Surface Geology

The digital atlas will provide a consistent, province-wide representation of the near-surface geology of Alberta, including surficial geology, bedrock geology, bedrock topography and drift thickness. Surficial geology and bedrock geology are commonly represented as two-dimensional maps. Bedrock topography maps depict the three-dimensional variability of the uppermost bedrock surface, analogous to surface topographic maps. Drift thickness maps are isopach maps representing the three-dimensional volume of unconsolidated sediment lying above bedrock and are derived by subtracting top of bedrock elevations from surface elevations.

Bedrock Stratigraphy Beneath the Alberta Plains

This atlas will depict the strata of the Western Canada Sedimentary Basin (WCSB) beneath the Interior Plains of Alberta to a relatively shallow depth of approximately 500 m below surface. This will be done in a three-dimensional environment representing lithostratigraphic and sequence stratigraphic



Till sampling during surficial geology mapping southwest of Fort McMurray.



Resolving surficial map boundary discrepancies north of Nordegg.

surfaces and selected province-wide cross-sections. The surfaces will be built from well-log picks from attributed sources, including the 1994 Atlas of the Western Canada Sedimentary Basin, and from existing and future picks by AGS staff, with a data density of approximately one well per township. Subsequent versions of the atlas will incorporate deeper WCSB

geological strata. The development of this deeper view of bedrock geology is focused on the WCSB beneath the Interior Plains because (i) these rocks host the vast majority of Alberta's oil and gas resources and may become important receptors of CO₂; (ii) over 80% of Alberta's geographic area lies within the Interior Plains; and (iii) data of sufficient quality and quantity exist to build an accurate three-dimensional geological model (geophysical well logs).



Geology near Elliot Peak in the Rocky Mountain Front Ranges west of Abraham Lake.



Examining Cretaceous stratigraphy in the Birch Mountains.

The focus of the first version of the digital atlas will be on the shallow bedrock strata and drift in Alberta because understanding these rocks and sediments is crucial to sustainable development of many earth resources in Alberta, including bitumen, coal, coalbed methane, shallow gas, sand and gravel, uranium,

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- e-mail: EUB.AGS-Infosales@ercb.ca
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diamonds and geothermal energy. This geological knowledge is also necessary to support regulation and public-policy development surrounding groundwater, land use, environmental protection, waste disposal and public safety from natural geological hazards. Following delivery of version 1.0 in 2012, additional work will improve the resolution of existing geological representations, extend the geological framework to greater depths, and see the incorporation of thematic information produced by AGS and others (e.g., aquifer locations, geothermal properties, CO₂ storage capacity of reservoirs, geohazard evaluations, mineral resource information and geochemical survey data).



Luscar Formation exposed in canyon cut by the Bighorn River southwest of Nordegg.

Initial office work on the digital atlas includes compiling surficial geology maps of west-central Alberta with varying legends and scales, a pilot study to investigate methodologies for extending bedrock topography mapping into areas with inadequate coverage, construction of provincial-scale bedrock cross-sections, and compilation of bedrock geology maps in the Abraham Lake – Nordegg area of the Rocky Mountains and Foothills. Field work in 2007 that will contribute to the atlas included surficial geology mapping in northern Alberta, field reconnaissance to resolve surficial geology map boundary discrepancies north of Nordegg and bedrock geology investigations in the Abraham Lake area, the Nordegg area and in the Birch Mountains. ♦

Recently Released Publications

Digital Datasets

DIG 2007-0077 Surficial Geology, Alberta Foothills and Rocky Mountains (GIS data, polygon features).

DIG 2007-0078 Surficial Geology, Alberta Foothills and Rocky Mountains — Glacial Features (GIS data, line features).

Earth Sciences Reports

ESR 2007-08 Preliminary Water Well Sampling to Assess the Uranium Potential in the Whiskey Gap Area of Southern Alberta (NTS 82H/2, 3). 32.2 MB PDF. \$20.00.

ESR 2007-10 Sandstone-Hosted Uranium Potential of Southern Alberta — Preliminary Assessment. 62.6 MB PDF. \$20.00.

Geo-Notes

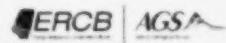
GEO 2007-01 Chemistry and Mineralogy of Kimberlite-Indicator Mineral Grains From a Till Survey of the Sawn Lake Area (NTS 84B/13), Southern Buffalo Head Hills, Alberta. 10 MB PDF. \$20.00.

Special Reports

SPE 096 Sphalerite and Kimberlite Indicator Minerals in Till from the Zama Lake Region, Northwest Alberta (NTS 84L and 84M). \$20.00 (also released as Geological Survey of Canada Open File 5692).

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Publication Types

- Atlas of the Western Canadian Sedimentary Basin
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Gas Shale in Alberta — Upper Colorado and Banff Shale Data Analysis

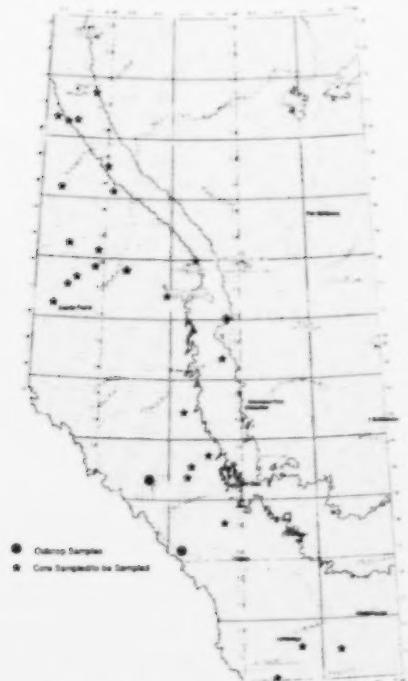
The Alberta Geological Survey has received funding from the Alberta Energy Innovation Fund to perform organic geochemical and geological evaluations on Cretaceous Colorado Group and the Mississippian Banff Formation shale and mudstone. The Upper Colorado Group was selected because of the presence of thick shale, spatial coverage of a large part of Alberta and shale gas activity as indicated by public and corporate release of information. The Banff Formation was chosen because of its thick shale intervals, proximity to the Exshaw shale and the presence of organic-rich carbonate mudstones that may be a potential future resource.

We will use the data for resource appraisal of Alberta shale gas and generate geochemical and geological maps to display an estimate of shale gas potential in these strata. The data will be made available on the AGS website in spring 2008 (www.agi.gov.ab.ca). A web page is being developed specifically for shale gas information. All maps, cross-sections and resource estimates will be published after the data release.

Approximately 300 samples have been selected for analysis with roughly an even split between core and outcrop. A list of analyses is as follows: isotherm (gas capacity), source rock potential (Rock Eval), grain size (sand/silt/clay weight per cent), petrography (thin section), XRD - whole rock, and clay mineralogy, palynology, organic petrography, permeameter, porosimeter, SEM/ESEM. Rock Eval will be done on most samples, while selected samples will be evaluated using the other analyses.

Included in the resource appraisal will be published geochemical and geological data from public reports, journals and ERCB ST-105, formerly known as Guide 14 (PVT and Core Studies Index). ♦

Map of Banff Core



Map of Alberta with locations of core sampled in the Banff Formation. Depth and lithology of samples will be delineated in the database and on all maps. The Banff subcrop edge is outlined by the green line, the Pekisko subcrop edge by the blue.

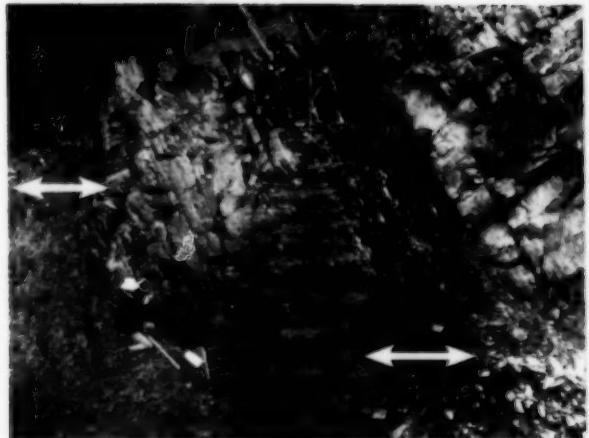
Map of Colorado Core



Map of Alberta with locations of core sampled in the Colorado Group. Specific formations in the Colorado Group along with lithology and depth of samples will be delineated in the database and on all maps.



Approximately 25 metre thick section from the top of the outcrop to the scree slope encompassing the Joli Fou to Fish Scales at Greystone Creek, Birch Mountains. Samples were taken every three metres.



Banff section near Nordegg: shale, calcareous shale and shaly lime mudstone have been sampled. Samples were taken every five metres and at lithological variations. The yellow arrows approximately indicate a 2 metre width of black shale.



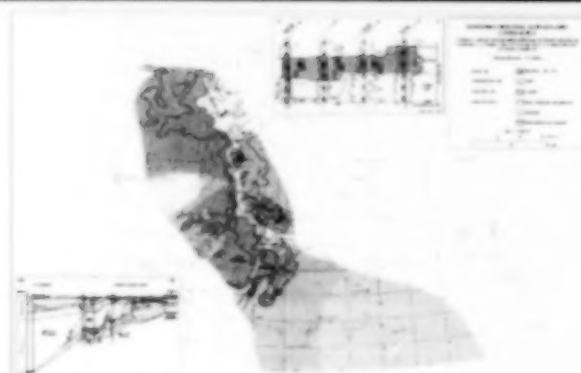
Exshaw-type section at Jura Creek near Canmore. Exshaw and lower Banff strata were sampled every one to two metres.

AGS Releases GIS Datasets of the 1994 Geological Atlas of the Western Canada Sedimentary Basin

The Geological Atlas of the Western Canada Sedimentary Basin has been a standard reference for geoscience professionals in Western Canada since it was published in 1994. Compiled by the late Grant Mossop, former head of the Alberta Geological Survey and director of the Geological Survey of Canada (Calgary), and Irena Shetsen, the atlas documents the geological history and subsurface geology of one of Canada's most significant hydrocarbon basins. Experts from government surveys, industry and academia contributed to the atlas' 33 thematic chapters, which contain over 650 maps, cross-sections and illustrations. Although the atlas has been out of print for many years, AGS provides web access to the text, raster images of the illustrations, and some underlying datasets (well control data, computer-generated grids for the structure of geological horizons and the thickness of geological units) at www.agso.gov.ab.ca/publications/ATLAS_WWW/ATLAS.shtml.

Many of the 230 maps in the atlas are regional in scope (1:5 000 000 scale) and depict the extent, lithological characteristics (lithofacies), spatial orientation (structure) and thickness of geological units in the subsurface. Geoscience professionals use this information as a broad guide and regional context for more detailed work. With the growing use of GIS mapping technology and software, requests have increased for the maps and/or individual map elements in GIS-ready format.

We are pleased to announce the release of shapefiles (i.e., polylines and polygons) of selected atlas maps (188 in total), produced from the digital files created and archived by AGS during production of the atlas. The available vector datasets are limited to the outlines of geological units and traces of geological features only; contour lines from structure and isopach (thickness) maps are not included at this time. The spatial features are tagged with descriptive information and consolidated into single shapefiles by feature type (i.e., polyline or polygon) and by figure. Example attribute tables for the polyline and polygon shapefiles comprising atlas Figure 12.17 are shown on the next page. For ArcMap users, layer files that render the shapefile data as they appear in the atlas (this page) are supplied with the shapefile data. The atlas shapefiles can be downloaded from www.ags.gov.ab.ca/publications/ATLAS_WWW/ATLAS.shtml. ♦



Digital raster image for Figure 12.17, Chapter 12 in the atlas



Depiction of polygon shapefile data for Figure 12.17, Chapter 12 in the atlas.



Depiction of polyline shapefile data for Figure 12.17, Chapter 12 in the atlas.

FID	Shape	ID	MAP_NAME	DESCR1
0	Polyline	1333	Duvernay Interval Isopach and Lithofacies	Woodbend zero edge
1	Polyline	1334	Duvernay Interval Isopach and Lithofacies	Peace River Arch outline
2	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
3	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
4	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
5	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
6	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
7	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
8	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
9	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
10	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline
11	Polyline	1335	Duvernay Interval Isopach and Lithofacies	Leduc reef outline

Attribute table of the polyline shapefile for Figure 17 from Chapter 12 in the atlas.

FID	Shape	ID	MAP_NAME	DESCR1
0	Polygon	1325	Duvernay Interval Isopach and Lithofacies	Bituminous-rich shale
1	Polygon	1327	Duvernay Interval Isopach and Lithofacies	Shale
2	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
3	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
4	Polygon	1329	Duvernay Interval Isopach and Lithofacies	Mixed siliciclastics and carbonates
5	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
6	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
7	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
8	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
9	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
10	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
11	Polygon	1328	Duvernay Interval Isopach and Lithofacies	Dolomite
12	Polygon	1330	Duvernay Interval Isopach and Lithofacies	Limestone

Attribute tables of the polygon shapefile for Figure 17 from Chapter 12 in the atlas.

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The following AGS staff members may be contacted for further information on their articles or citations.

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Conferences Involving Alberta Geological Survey

Calgary Mining Forum (MEG)

April 16th and 17th, 2008

Downtown Ramada Hotel

Calgary, Alberta

GeoEdmonton '08

61st Canadian Geotechnical Conference and 9th Joint CGS/IAH-CNC Groundwater Conference

September 21-24, 2008

Westin Edmonton

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